CLAIMS:

1. A method of detecting a target signal, the method involving combining a primary representation of a transmitted signal and a primary representation of a received signal, after modifying one of the primary representations using an auxiliary representation, and determining from the result of the combination whether the target signal is present,

characterised in that the auxiliary representation comprises a multi-frequency signal having multiple concurrent components of different frequencies within a frequency range corresponding to possible Doppler shifts in the target signal, whereby a received signal exhibiting a Doppler shift corresponding to a said frequency produces a significant response in the combination result.

2. A method as claimed in claim 1, wherein the auxiliary representation components have frequencies spread throughout the predetermined range of possible Doppler shifts, whereby a received signal which exhibits any Doppler shift within the predetermined range results in a significant response in the combination result.

3. A method as claimed in claim 1 or claim 2, wherein the different frequencies are respective harmonics of a common basic frequency.

4. A method as claimed in any preceding claim, wherein the auxiliary representation has a finite duration, the primary representations being combined throughout that duration to produce said result.

5. A method as claimed in claim 4, wherein the duration is substantially equal to an integral number of periods of the lowest frequency component.

6. A method as claimed in claim 4 or claim 5, wherein the auxiliary representation is formed using a predetermined window function.

7. A method as claimed in any preceding claim, including the step of modifying one of said primary representations with at least one further auxiliary representation, the respective auxiliary representations having components of different frequencies.

8. A method as claimed in claim 7, wherein the frequencies of the components of a first of the auxiliary representations are interleaved with the frequencies of the components of another auxiliary representation.

9. A method as claimed in claim 7 or 8, wherein the respective results produced when the auxiliary representations are modified with a primary representation are combined.

10. A method as claimed in claim 9, wherein the auxiliary representations give rise to complementary frequency response characteristics, whereby the frequency response of the combined results is substantially flat throughout said frequency range.

11. A method as claimed in any preceding claim, including the step of using first and second auxiliary representations, the components of the first auxiliary representation being in quadrature relationship with corresponding components in the other auxiliary representation, the method including the step of simultaneously modifying the first and second auxiliary representations with respective versions of one of the two primary representations and combining the respective modified representations with the other primary representation to produce a result indicative of the presence of the target signal.

12. A method as claimed in any preceding claim, including the step of providing a first set of auxiliary representations of finite duration and a second set of auxiliary representations of finite duration, and interleaving the auxiliary representations of the first set with the auxiliary representations of the second set.

13. A method as claimed in any preceding claim, wherein the primary representations are combined by correlation.

14. A method as claimed in any one of claims 1 to 12, wherein one of the primary representations is a signal which is combined with the other primary representation by being applied to a filter matched to said other primary representation.

15. A method as claimed in any preceding claim, when used for detecting the presence of an object which produces said target signal by reflection of said transmitted signal.

16. A method as claimed in claim 15, including determining from the result of said combination the range of the object.

17. A method as claimed in any preceding claim, including the step of digitally synthesising the auxiliary representation using stored sample values.

18. A method as claimed in claim 17 when directly or indirectly dependent on claim 4, wherein the components of the auxiliary representation have phase values at the beginning of the representation which are such as to obtain a peak factor for the representation of less than two.

19. A method as claimed in claim 18, wherein the phase values of the components at the beginning of the representation are selected from a first value and a second value, the first and second values differing by π.

20. A method of detecting a target signal, the method involving combining a primary representation of a transmitted signal and a primary representation of a received signal, after modifying one of the primary representations using an auxiliary representation, and determining from the result of the combination whether the target signal is present,

characterised in that the auxiliary representation comprises a multi-frequency signal having multiple concurrent components of different frequencies within a frequency range corresponding to possible frequency discrepancies between the transmitted and received signals, whereby a received signal exhibiting a discrepancy corresponding to a said frequency produces a significant response in the combination result.

21. Apparatus for detecting a target signal, the apparatus being arranged to operate in accordance with a method of any one of the preceding claims.

22. A signal processing method in which a primary signal is modified by, at least, first and second auxiliary signals in order to investigate the primary signal, each auxiliary signal comprising successive finite-duration shaped portions having relatively low-amplitude leading and trailing parts, the portions being interleaved with, and overlapping, signal portions of the other auxiliary signal.

23. A method as claimed in claim 22, wherein each shaped portion has a shape substantially similar to that of a squared cosine.

24. A method as claimed in claim 23, wherein each shaped portion is produced using a modified Kaiser window function.